

## LITHOLOGIC DESCRIPTIONS

GETTY OIL CO. #33  
SW $\frac{1}{4}$ , SW $\frac{1}{4}$ , SEC 14, T5S, R97W, GARFIELD COUNTY, COLORADO

### DRILL CUTTINGS

0	-	12	Alluvial material predominately sandstone (rounded) fragments with some marlstone.
12	-	22	Some yellow and red sandstone, more commonly light gray marlstone.
22	-	32	Equal amounts of marlstone and sandstone.
32	-	41	Marlstone and shale with rare sandstone.

### CORE DESCRIPTION \*

42.1	-	46.9	Marlstone - buff to light brownish gray; HCl - yes; chalky luster; laminated with common streaked bedding, distorted bedding more common towards bottom; tuff layer at 42.3; pyrite streaks and stringers common throughout.
46.9	-	71.3	Sandstone - light gray to light brownish gray; HCl - minor to yes; chalky luster; massive with common highly irregular and distorted silty laminae; common pyrite blebs 51.0 - 59.3; common gilsonite throughout; fractured 56.3 - 57.3, 60.3 - 62.3 and 69.3 - 70.3.
71.3	-	93.3	Sandstone - light gray to light brownish gray; HCl - minor; chalky luster; massive

\* Core incorrectly marked to 233.3; short 0.3 ft.; top should be 42.1 ft.

with common brown silty laminae exhibiting flow and slump features; common pyrite and gilsonite with pyrite concentrations along silty laminae; fractured 77.3 - 78.3 and at bottom. 87.9 - 93.3 missing.

93.3 - 123.3

Sandstone - gray to medium brownish gray; HCl - minor; chalky luster; massive with dark interbedded silts, common distorted bedding with common flow and slump features; light tuffs with pyrite blebs from 100.3 - 102.4, pyrite bleb at 102.2 is 1 inch by  $\frac{1}{2}$  inch; common pyrite and gilsonite throughout; fractured lower portion; irregular tuff blebs and stringers from 112.3 to bottom.

123.3 - 154.4

Sandstone - light gray to light brownish gray and buff; HCl - minor to yes; chalky luster; massive with rare laminated zones; rare kerogen-rich laminae; common pyrite blebs 135.0 - 135.9, common pyrite and gilsonite throughout; some fractures throughout; solution cavities at 136.6, 137.0, and 148.1; gray tuff at 143.2 with some tuff blebs and streaks to bottom. 149.45 - 149.95 Compressive Strength Sample.

154.4 - 177.4

Oil shale with some marlstone - light and medium brownish gray with rare dark brownish gray; HCl - yes; earthy luster; laminated with common distorted bedding; tuff beds at 155.3, 155.65, 156.9, 165.8, 170.5, 170.7, 173.9, 176.0, and 176.9; fractured from 160.1 - 161.8; some pyrite streaks and stringers throughout.

177.4 - 186.25

Marlstone/siltstone - medium with some light brownish gray; HCl - minor to yes; earthy luster; laminated with some streaked bedding, some distorted bedding becoming more common at bottom; tuff layers at 178.5, 182.5, 183.4, and 185.2; gilsonite coating at bottom; some pyrite throughout. 183.2 - 183.3 missing.

186.25- 242.5

Sandstone - gray to light gray with some medium brownish gray; HCl - minor; chalky luster; banded to massive with some laminations, laminae demonstrate highly distorted and wavy bedding; common tuff layers and blebs to 201.3, tuffs 215.5

and 218.0 - 220.3; some tuffs 225.6 to bottom; common pyrite and gilsonite throughout; fractured upper portion to 195 and some fractures vicinity missing intervals. 192.2 - 193.3, 209.9 - 213.3, 223.2 - 223.3, 228.8 - 233.3, and 241.85 - 242.5 missing.

242.5 - 246.4

Sandstone - gray with some light gray; HCl - minor; chalky luster; massive with some brown silty laminae, highly distorted; upper portion to 243.3 contains some marlstone, common gilsonite stringers and streaks, and some pyrite throughout.

246.4 - 247.7

Marlstone/oil shale - light, medium and dark brownish gray with some gray; HCl - minor to yes; earthy luster; laminated to banded with highly contorted laminations; minor fractures contain calcite and gilsonite; some interbedded tuffs lower portion.

247.7 - 251.75

Sandstone with some marlstone - gray to light gray with some medium brownish gray; HCl - minor to yes; chalky luster; massive with some laminations lower portion; fractured from 249.5 to bottom; common, large pyrite blebs 248.0 - 249.7.

251.75 - 257.5

Marlstone and oil shale - light to medium brownish gray and greenish brown; HCl - yes; earthy with rare satiny luster; laminated with common streaked and highly distorted bedding; tuffs at 253.0, 254.7, and 256.1 contain calcite and oil; fractured top of interval.

257.5 - 263.9

Sandstone - light to medium gray with some medium brownish gray; HCl - minor to yes; chalky luster; massive with common highly distorted laminae; oil in fracture at 261.8, fractured to 262.4; reddish gray tuff (0.2 ft) at bottom; common pyrite, rare gilsonite throughout.

263.9 - 281.8

Marlstone with some oil shale - light to medium brownish gray with some greenish brown; HCl - yes; earthy luster; laminated to faintly laminated with some distorted bedding; tuffs are calcite and gilsonite filled with some oil present and are associated with fractures(?) at 264.1,

266.0, 267.4, 268.2, and 268.35; interval 269.5 to 271.7 has abundant tuffs with some oil shale; 278.8 - 279.2 has some oil flowing from tuff; tuffs with calcite and pyrite 279.6 and 280.6.

281.8 - 284.6

Sandstone - medium gray with some light brownish gray; HCl - yes; massive with rare distorted laminae, marlstone interval 283.7 - 284.0; some gilsonite streaks throughout; tuff layer at bottom of interval.

284.6 - 291.4

Marlstone and oil shale - light to medium brownish gray; HCl - yes; earthy luster; laminated with some loop structures and distorted bedding; common distorted beds from 289.6 with intertonguing medium gray sandstone 290.15 and 290.6 - 290.8; some tuff (?) streaks lower interval; calcite and tuff at 289.1; rare gilsonite stringers throughout.

291.4 - 317.25

Sandstone - light to medium gray with some medium brownish gray; HCl - yes; chalky with rare earthy luster; massive with some highly distorted laminations; marlstone zones 308.2 - 309.0, 312.1 - 313.0, 315.2, and 316.3 - 316.7; tuffs 303.5, 306.0, 312.4 and at bottom; common gilsonite and pyrite throughout; solution cavities 298.0 - 298.3; minor fracturing 310.0 - 312.0.

317.25- 322.2

Marlstone and oil shale - light to medium brownish gray; HCl - yes; earthy luster; laminated with common loop structures, streaked and distorted bedding; tuffs at top, 318.45, 319.1 - 319.2, 319.35 - 319.65 and 320.2 - 320.5 with some irregular stringers 321.0 - 322.0, rare gilsonite stringers throughout.

322.2 - 328.8

Sandstone - light, medium and dark gray; HCl - yes; chalky luster; massive with some highly distorted laminations; zones of marlstone and tuff with some kerogen-rich laminae 322.8 - 323.0, 325.35 - 325.45, 325.6 - 326.0, 326.3 and 328.5, dark gray tuff (0.2 ft.) at bottom.

328.8 - 334.85

Oil shale and marlstone - buff to light and medium brownish gray; HCl - minor;

earthy luster; laminated with common loop structures and distorted bedding; rare irregular tuff stringers throughout; fractured at 330.5.

334.85- 343.4

Oil shale with some marlstone - light to medium brownish gray with rare dark brownish gray; HCl - minor to yes; earthy luster; laminated to faintly laminated and banded with common loop structures and distorted bedding; some tuff streaks and stringers throughout; bedding reversal at 341.7, probable subsidence.

343.4 - 362.55

Marlstone and gilsonite with some oil shale - light to medium brownish gray; HCl - yes; earthy luster; laminated to banded with some distorted bedding; interval has common fractures with some shattering; gilsonite and calcite fillings throughout, tuffs with gilsonite and calcite 351.3, 353.5, 353.8 and 354.3; irregular tuffs 355.0 - 356.6; tuffs 358.0, 358.9, 360.7 and irregular tuffs 361.2 to bottom; tight fracture traces throughout with major gilsonite zones at top to 345.35, 346.25, 347.0, 348.7 - 349.2, 350.1 and 357.2.

362.55- 366.65

Oil shale - light to medium brownish gray with some buff; HCl - minor; earthy luster; laminated to faintly laminated with some loop structures and streaked bedding; tuff with pyrite at 363.25, irregular tuff stringers throughout.

366.65- 373.4

Sandstone and marlstone - medium gray to light and medium brownish gray; HCl - yes; chalky to earthy luster; laminated to massive; interbedded marlstone 367.6 - 367.85, 368.25 - 368.5, 368.75 - 368.95, 369.0 - 369.9, 370.7 - 370.8, 371.9, 372.5, 372.8 and at bottom; marlstone units contain irregular tuffs and entire interval exhibits intertonguing of marlstone and sandstone; some gilsonite throughout.

373.4 - 378.5

Sandstone - medium gray to medium brownish gray; HCl - yes; chalky luster; massive with some laminations, common distorted bedding; common tuff blebs and stringers throughout; minor fracturing to 375.7.

378.5 - 384.9

Oil shale - light to medium brownish gray; HCl - minor; earthy luster; laminated to faintly laminated with common streaked and distorted bedding; irregular tuff layer at 379.85 with some stringers and streaks to 380.9; fractured zone 381.7 - 382.3 with crystalline calcite and altered tuff; tuff and oil shale zones with pitted core 382.6 - 383.0, 383.25 - 383.4 and 384.3; irregular tuffs to 384.8, with tuff and calcite at 384.9; zone from 382.6 to 384.3 exhibits shattering and recementation; tuff at bottom has soft, black alteration.

384.9 - 393.6

Oil shale - light to medium brownish gray; HCl - yes; earthy luster; streaked bedding with common laminations and distorted bedding; tuff at 389.4 and 390.0; tight fracture at 387.0 and fractured from 390.0 - 391.2; altered tuff at 392.0. 392.2 - 392.8 Compressive Strength Sample. 393.0 - 393.6 missing.

393.6 - 402.7

Oil shale - light, medium and dark brownish gray; HCl - no to yes (light sections); earthy with rare satiny luster; laminated to faintly laminated with common streaked bedding; rare loop structures and distorted bedding; tuffs at 394.5 (distorting lower bedding), and 395.6; interbedded tuffs 398.4 - 399.0; irregular tuff at 399.3; rare tuff stringers and streaks throughout.

402.7 - 405.7

Oil shale - light to medium brownish gray; HCl - minor to yes; earthy luster; laminated with common streaked bedding; common silty tuff laminae throughout interval; irregular tuff at 405.5; fractured at 404.0 with calcite and pyrite filling.

405.7 - 412.4

Oil shale - light to medium brownish gray with some dark brownish gray; HCl - no to minor; earthy luster; laminated with common streaked and distorted bedding; bedding distorted by tuff blebs at 406.8; tuffs 411.4 and 412.4; fractured 410.7 and 411.0.

412.4 - 423.7

Oil shale - light, medium and dark brownish gray; HCl - minor to yes; earthy luster; laminated with common streaked bedding and rare loop structures; tuffs

418.3, 420.6, 421.6 and 423.1; some tuff stringers throughout; fractured 415.0, 416.3, 416.6, 418.2 and 419.4 - 420.5 with some jumbling.

423.7 - 432.3

Oil shale - medium to dark brownish gray; HCl - minor to yes; earthy luster; faintly laminated to laminated with common streaked bedding; core has a zonal or mottled-looking coloration; irregular tuffs 426.0 and 429.8; tuff layer at 431.4; rare tuff streaks throughout.

432.3 - 447.4

Oil shale - medium to dark brownish gray; HCl - yes; earthy with rare satiny luster; laminated to faintly laminated to 436.0 with common streaked bedding; laminated with common loop structures and distorted bedding to bottom; irregular tuff blebs 432.8 and 434.2; analcitized tuff at 435.5; fracture series (3) at 435.6 - 436.0, tuffs 440.15, 441.15 and 443.3; some tuff streaks and stringers throughout.

447.4 - 450.85

Oil shale - medium brownish gray with some light and dark brownish gray; HCl - minor; earthy with some satiny luster; laminated with rare loop structures and common distorted bedding, common interbedded tuff streaks throughout, mildly distorting bedding.

450.85- 457.0

Oil shale - medium to dark brownish gray with rare light brownish gray; HCl - minor to yes; earthy to satiny luster; laminated with some loop structures and distorted bedding; interbedded tuff at 451.4 distorting upper laminations; fractured at 456.0 with calcareous filling; tuff stringer at 456.8.

457.0 - 459.15

Oil shale - light, medium and dark brownish gray; HCl - minor to yes; earthy luster; varved with highly distorted and displaced bedding; slickensides throughout with bedding assuming a 50° dip; common solution vugs with calcite and pyrite at top; microfaulting (0°-10°) common throughout. 457.5 - 457.7 missing.

459.15- 463.8

Oil shale - light, medium and dark brownish gray; HCl - minor; earthy with some satiny luster; laminated with some

- loop structures and common streaked bedding; fractured at 460.4 with dolomitic and pyritic filling; tuff stringers 460.7, 461.0, 462.4, 463.6 and at bottom; some tuff streaks and stringers throughout.
- 463.8 - 466.15 Oil shale - medium to dark brownish gray; HCl - minor; satiny with rare earthy luster; laminated with some loop structures; tuffs 464.05, 464.3 and 465.5; rare tuff stringers throughout.
- 466.15- 470.6 Oil shale - light to medium brownish gray; HCl - minor; earthy luster; laminated with some loop structures and streaked bedding; common pyrite streaks throughout; tuff at 467.97, with rare stringers throughout.
- 470.6 - 472.9 Oil shale - medium to dark brownish gray; HCl - no; satiny with some vitreous luster; laminated to varved with rare loop structures, some streaked and distorted bedding; tuff layer at 470.1 distorting lower bedding.
- 472.9 - 486.0 Oil shale - light to medium brownish gray with some dark brownish gray; HCl - minor; earthy luster; laminated with common streaked bedding, rare loop structures; interbedded tuff at 473.7 with rare tuff stringers and some tuff streaks throughout; fractured at 478.0.
- 486.0 - 488.4 Oil shale - medium to dark brownish gray; HCl - no; satiny with some earthy luster; laminated with common streaked, rare distorted bedding; tuff stringers at 487.3 and 487.4, with some gray tuff streaks interbedded throughout.
- 488.4 - 494.45 Oil shale - light, medium and dark brownish gray; HCl - minor; earthy luster; laminated to faintly laminated with common streaked bedding; tuff streaks and stringers throughout with tuff layers at 489.75 and 490.1; fractured from 492.2 to 493.0 with soft, white, calcareous filling; tuff stringers at 492.8; fractured at bottom.
- 494.45- 502.3 Oil shale - light, medium and dark brownish gray; HCl - minor; earthy to satiny luster; laminated with common streaked bedding; rich zone to 496.0; fractured at top and



499.7; interbedded tuff at 497.4 with common tuff stringers 499.5 - 501.0; some tuff streaks throughout.

502.3 - 503.95

Oil shale - medium to dark brownish gray; HCl - no to minor; satiny with rare earthy luster; laminated to faintly laminated with common streaked bedding.

503.95- 509.3

Oil shale - light to medium brownish gray with rare dark brownish gray; HCl - no to minor; earthy luster; laminated to faintly laminated with common streaked bedding; tuff stringer at 504.95; bedding fracture (?) with oil stain at 508.2.

509.3 - 510.9

Oil shale - medium to dark brownish gray; HCl - no; earthy with rare satiny luster; laminated with rare streaked, common distorted bedding; interbedded tuff at 509.5 with some dead oil; rare tuff stringers with dead oil to bottom.

510.9 - 525.8

Oil shale - light to medium brownish gray with rare dark brownish gray; HCl - minor to yes; earthy luster; laminated to faintly laminated with common streaked bedding; tuffs 511.6 and 511.8; drilling breakage at 512.0; soft tuff with dead oil and drilling breakage 512.4 - 512.7; soft interbedded tuff at 513.5; tuff layers 514.6, 517.55, 518.2, 518.75, 520.2; soft, analcitized tuff at 521.7 with minor solution; interbedded tuff at 523.2; fractured at 524.3 with white dolomitic coating.

525.8 - 528.0

Oil shale - medium to dark brownish gray; HCl - no; earthy with some satiny luster; laminated with common streaked and distorted bedding, rare loop structures; some very thin analcitized tuff stringers throughout interval.

528.0 - 548.6

Oil shale - medium to dark brownish gray with rare light brownish gray; HCl - minor; earthy with rare satiny luster; streaked bedding with common faint laminations and rare distorted bedding; tuff layers 532.3, 532.7, 533.2 and 533.7; tuffs with dead oil and highly distorted rich zones below, 537.15, 537.55, 539.6, 540.2, 540.6 and 546.15; some tuff streaks and stringers

throughout. 530.0 - 530.5 Compressive Strength Sample.

548.6 - 568.1

Oil shale - medium to dark brownish gray with rare light brownish gray; HCl - minor to yes; earthy with rare satiny luster; streaked bedding to faint laminations, rare distorted bedding; tuff at 548.4; interbedded tuffs and oil shale 548.7 - 549.8; tuffs 550.0, 550.6, 556.75 (minor bedding distortion), 558.9 and 559.0 - 559.2 (interbedded); analcitized tuff 560.6 - 560.85; interbedded tuff zone at 561.4; analcitized tuffs 566.3 and 566.9; rare tuff streaks and stringers throughout.

568.1 - 587.3

Oil shale - medium to dark brownish gray with some light brownish gray; HCl - minor to yes; earthy with some satiny luster; streaked bedding to faint laminations with rare laminated zones, some distorted bedding; fractured 568.6 - 569.0 with white, calcareous filling; tuffs 573.15 and 574.1; fractured 575.0 - 575.5 with dolomitic filling, fractured 577.0 - 577.2 and 578.0 - 578.7 with moderate jumbling and breakage; drilling breakage at 583.5; fractured at 585.4; tuff bleb at 585.1; interbedded tuff and oil shale 586.3 - 586.5; some tuff streaks and stringers throughout interval.

587.3 - 590.1

Oil shale and tuff - medium to dark brownish gray; HCl - minor; earthy with rare satiny luster; streaked and distorted bedding with interbedded, oil stained tuffs containing some calcite; pitting of core throughout interval.

590.1 - 619.6

Oil shale - medium to dark brownish gray with rare light brownish gray; HCl - minor to yes; earthy with rare satiny luster; streaked bedding to faintly laminated with some zones of laminations, some distorted bedding; tuffs 590.4, 592.3, 592.5; fractured 604.3 and 604.75; zones of interbedded, oil stained tuff 605.4 - 605.65 and 606.15 - 606.25; fractured 609.3; very dark zone 613.7 - 614.1; tuffs 616.9 and 618.6; some tuff streaks and stringers throughout. 600.9 - 603.0 missing - nahcolite cavity (?)

619.6 - 636.2

Oil shale - medium to dark brownish gray; HCl - yes; earthy luster; streaked bedding to faintly laminated with common laminations, rare distorted bedding and loop structures; rich zones 624.0 - 624.4 and 627.0 - 628.4.

636.2 - 644.05

Oil shale - light, medium and dark brownish gray; HCl - no (dark sections) to yes; earthy with rare satiny luster; laminated with rare loop structures and distorted bedding, some streaked bedding; fractured at top and 637.0; irregular tuff at 638.2; tuff stringer at 639.3; gray tuff at 641.65 and analcitized tuff at 641.75; 641.8 - 642.2 has common interbedded tuff stringers; rare tuff streaks throughout.

644.05- 649.95

Oil shale (lean) - light to medium brownish gray with rare buff; HCl - yes; earthy luster; laminated with some distorted bedding; fractured 645.0 - 646.0 (three fractures); tuff at 648.9; fracture(s) at 648.8.

649.95- 653.9

Mudstone - buff to light brownish gray; HCl - minor; chalky luster; laminated to faintly laminated with some streaked bedding; gray tuff at 650.6; tight fractures 651.0 - 651.4; breakage with possible fracture at 653.55. 651.75 - 652.35 Compressive Strength Sample. TOP "A" GROOVE (?)

653.9 - 656.15

Mudstone/oil shale - light to medium brownish gray and light greenish brown; HCl - minor; chalky to earthy luster; laminated to faintly laminated; solution cavity (0.25 ft.) at 654.3 with analcite and pyrite; light gray tuff bands 655.05, 655.2, 655.3 and 655.45; fractured at 656.1.

656.15- 667.1

Oil shale and interbedded tuffs - light, medium, and dark brownish gray to black with rare light greenish brown and some buff; HCl - minor; earthy to satiny luster; laminated with distorted bedding; dark zone to 657.6 contains buff-colored tuffs with moderate distortion at bottom; light zone to 662.0 contains high distortion and interbedded tuffs to 658.8;

658.8 to 660.4 contains blebs and stringers with mild distortion; 660.4 to 662.0 contains layers and blebs to 0.05 ft high, highly distorting bedding below each zone, mild distortion above, with tuff (0.15 ft) at 661.75; dark zone, 662.0 - 663.5 contains interbedded tuffs and layers with high distortion; tuff layer at 662.75 - 663.1 load casted below; 663.1 to 666.3 has tuff blebs and stringers; 666.3 to bottom is highly distorted with rare displacement and slumpage. TOP MAHOGANY ZONE.

667.1 - 676.2

Oil shale - medium brownish gray with some light brownish gray; HCl - minor; earthy luster; laminated with some streaked bedding; tuff stringers 667.7, 668.7 and 669.35, rare streaks and blebs throughout; minor drilling breakage above 672.0; gray tuff layer at 675.75; medium gray tuff 675.8 to 676.2 (MAHOGANY MARKER?).

676.2 - 679.55

Oil shale - light to medium brownish gray with rare dark brownish gray; HCl - minor; earthy luster; laminated with some streaked bedding; some tuff streaks and stringers throughout.

679.55- 680.9

Oil shale - medium and dark brownish gray to black; HCl - minor; satiny luster; laminated with rare loop structures and streaked bedding; fractured from 679.7 - 680.7, with white, calcareous filling.

680.9 - 683.1

Oil shale - light to medium brownish gray; HCl - minor; earthy luster; laminated with rare loop structures and distorted bedding; pyrite blebs and stringers 681.2 - 681.5 with bedding distorted below zone; rare tuff streaks throughout.

683.1 - 695.4

Oil shale - medium and dark brownish gray to black with rare light brownish gray; HCl - no to minor; satiny with common vitreous and rare waxy luster; laminated with some loop structures and distorted bedding; light gray tuff 684.5 - 684.65; tuff at 685.65; 688.95 - 689.9 contains 7 zones of buff-colored tuffs with interbedded oil shale; tuff with oil staining at 695.2. MAHOGANY BED.

695.4 - 698.0

Oil shale - medium with some light brownish gray; HCl - yes; earthy luster; laminated to faintly laminated with common streaked bedding; tuff stringer at 697.6.

698.0 - 703.7

Oil shale - medium to dark brownish gray and black; HCl - minor to yes; earthy to satiny luster; laminated with some loop structures and distorted bedding, distortion caused by small tuff blebs throughout; tuff layer at 700.5.

703.7 - 707.9

Oil shale - light, medium and dark brownish gray to black; HCl - no to minor; earthy to satiny luster; laminated with common distorted bedding; common light brownish gray tuff blebs and layers throughout, locally distorting bedding; light gray tuff at 705.2.

707.9 - 720.3

Oil shale - medium with some light and dark brownish gray; HCl - minor to yes; earthy luster; laminated with some streaked and distorted bedding; common tuff streaks and stringers to 709.7; fractured 710.7 - 711.0 with solution cavity and some interbedded tuffs 711.0; fractured at 712.1 and from 714.2 to missing interval with heavy jumbling; tuff layers 715.6 and 715.9; tuff blebs 716.15 and 718.3; some tuff stringers 716.5 to bottom. 714.65 - 715.6 missing.

720.3 - 729.5

Oil shale - light to medium brownish gray with some dark brownish gray streaks; HCl - minor; earthy luster; streaked bedding as noted with some laminations and some distorted bedding; fractured at 722.1; zone of interbedded tuffs with dead oil 722.3 - 723.0; fractured 723.0 - 723.85 with solution cavity at 723.75; solution cavity at 724.0 with interbedded tuffs to 725.3; fractured 725.6, 726.4, 727.4 and 727.7. 723.85 - 724.0 missing.

729.5 - 734.75

Oil shale - medium with rare light brownish gray; HCl - minor; earthy luster; laminated with some distorted bedding; interbedded tuffs with pyrite, top to 729.9; remainder contains tight, calcareous filled fractures (70°-80°); jumbling at 733.8.

734.75- 743.9

Oil shale - light to medium brownish gray; HCl - yes; earthy luster; laminated to faintly laminated with common streaked bedding, rare distortion; tuff layers 735.7 and 738.1; fractured at 738.35; tuff layers 740.6, 741.85 and at bottom; some tuff stringers throughout.

743.9 - 750.1

Oil shale - light, medium and dark brownish gray; HCl - minor; earthy luster; laminated with common streaked and distorted bedding; tuff blebs with mild bedding distortion at 745.9; tuff layer at 747.7; pitted and worn zone at 748.6; rare tuff stringers and streaks throughout.

750.1 - 753.8

Oil shale - light to medium brownish gray; HCl - minor; earthy luster; laminated to faintly laminated with common streaked bedding; tuff layer at 751.25; fracture zone 752.5 - 753.2 with three light gray tuffs, moderate breakage and minor solution of tuffs.

753.8 - 761.35

Oil shale - medium to dark brownish gray with rare light brownish gray; HCl - minor; earthy luster; laminated with some streaked and common distorted bedding; slickensides at top of interval; tuff layer distorting upper and lower bedding 754.65 - 764.75; interbedded tuff zones 755.6 and 755.8; tuff layers 757.05 and 759.75; tuff zone 760.1 - 760.3 with oil shale inclusions.

761.35- 767.9

Oil shale - light to medium brownish gray; HCl - minor; earthy luster; laminated to faintly laminated with common streaked bedding; fractured from top to 762.0; fracture (?) and drilling breakage 763.2 - 763.5; fractured at 764.0, 765.0 and 766.5 - 767.0; shaly parting and fractures 767.0 - 767.9. BOTTOM MAHOGANY ZONE.

767.9 - 773.6

Mudstone and lean oil shale - light brownish gray with some medium brownish gray; HCl - no; earthy luster; laminated to banded with common distorted bedding; light and dark gray banded tuff at top with minor solution; fractured 770.3, with blebs of calcite and pyrite to 770.7; fractured 771.0; tuff and pyrite stringer

771.4 with pyrite blebs and stringers to 772.0; fractured 772.0 and 773.0 - 773.4; some tuff and pyrite stringers at bottom; fractured 769.0; light and dark gray banded tuff at 769.6. TOP "B" GROOVE.

773.6 - 777.35

Siltstone and mudstone - light gray to light brownish gray; HCl - no; chalky to earthy luster; massive to banded with rare highly distorted laminations; pitting throughout with common, small solution cavities; microfractures with calcite coating throughout.

777.35- 780.6

Mudstone - medium gray to medium brownish gray; HCl - no; chalky luster; laminated with common streaked bedding; fractured at top to 778.0 and 778.7 - 779.3; shaly parting 779.3 to bottom; fractured 779.8 - 780.0 and 780.3; common pyrite and tuff stringers throughout.

780.6 - 781.85

Siltstone and tuff - medium gray to medium brownish gray; HCl - no; chalky luster; rare, distorted laminations; common solution cavities and heavy pitting; dead oil throughout interval. BOTTOM "B" GROOVE (?).

781.85- 788.15

Oil shale - light, medium and dark brownish gray with rare black; HCl - no to minor; earthy to satiny luster; laminated with rare loop structures and streaked bedding, some distorted to highly distorted bedding; bedding at top moderately distorted by tuff interval above; tuff at 782.3 exhibits load casting into lower beds, highly distorting laminations; interbedded tuff at 786.2; some tuff streaks and stringers throughout. TOP "R-6".

788.15- 799.2

Oil shale - light and medium brownish gray with common medium greenish brown; HCl - minor; earthy luster; laminated with common streaked bedding; analcitized tuffs 788.3 - 788.45 and 788.9 - 789.0; tight fracture 789.0 - 789.4; analcitized tuff 790.5 - 790.7 with fractures and dead oil; oil stained fracture 790.7 - 791.0; tight fracture at 791.2; fractured 791.7 - 792.4 and 793.0 - 795.0 with moderate to heavy breakage; dark gray tuff at 793.7;

solution cavity above missing interval; broken at 795.5; tuff at 796.1; fractured 797.4 and 797.8; some tuff stringers throughout. 794.5 - 795.2 missing. 798.45 - 798.95 Compressive Strength Sample.

799.2 - 800.6

Oil shale - medium to dark brownish gray; HCl - no; earthy with some satiny luster; laminated with some distorted bedding; tuff blebs at 800.25; partially analcitized, dark gray tuff 800.45 - 800.6, bedding distorted above tuff zone.

800.6 - 812.8

Oil shale (lean) - light gray to light and medium brownish gray; HCl - minor; earthy luster; laminated with some streaked and distorted bedding; fractured at 801.0; recored with drilling breakage 802.7 - 803.7; fractured at 804.4; irregular analcitized tuff at 805.1; dark gray, partially analcitized tuff 808.9 - 809.15.

812.8 - 818.2

Oil shale - light, medium and dark brownish gray with some light greenish brown; HCl - no to minor; earthy with some satiny luster; laminated with some streaked and distorted bedding; zone of tuffs and interbedded tuffs 813.4 - 814.1, minor bedding distortion above and below zone; fractured at 815.9; tuff blebs 817.75.

818.2 - 823.8

Marlstone and siltstone - buff to light and medium brownish gray and light greenish brown; HCl - yes; chalky to earthy luster; laminated with some streaked and distorted bedding; rare bedding displacement by microfaulting; tuff zone at top with mild bedding distortion; fractured 819.1 and 820.4; tuff zone at 822.2 with some solution and pitting; 822.6 to bottom has some solution vugs with clay blades and pyrite; fractured at bottom.

823.8 - 833.4

Oil shale - medium to dark brownish gray; HCl - minor; earthy, with some satiny and rare vitreous luster; laminated with common streaked and distorted bedding; top to 824.3 has tuff bleeding oil with oil shale, heavy pitting and solution through zone; tuffs 825.8 and 826.1; fractured at 828.5; analcitized tuff at 830.2; rare tuff stringers throughout interval.



833.4 - 836.1

Oil shale/siltstone - medium to light brownish gray and light greenish brown; HCl - no; earthy luster; laminated with common streaked, rare distorted bedding; fractured 834.8 and at bottom; gray tuff layer at 834.05; some tuff stringers throughout.

836.1 - 841.25

Oil shale - light, medium and dark brownish gray; HCl - no; earthy with rare satiny luster; laminated with common distorted bedding, some streaked bedding; 836.0 - 837.0 slump feature with interbedded pyrite and gilsonite; fractured with oil stained surfaces at 837.5; irregular tuff stringers 839.0 - 840.0; some tuff blebs interbedded 840.0 - 840.8.

841.25 - 847.8

Siltstone and mudstone - gray and bluish gray to medium brownish gray; HCl - no; chalky luster; laminated with common streaked bedding; buff-colored tuff at top; fractured 842.8, 844.5, 845.5, 846.8 and 847.3; common tuff streaks and stringers throughout.

847.8 - 856.1

Oil shale - medium to dark brownish gray with rare light brownish gray; HCl - no; earthy luster; laminated with rare faint laminations; some streaked and distorted bedding; fractured 848.0 and 848.3; some interbedded tuffs to 851.0, with tuff layer at 851.15; fractured from 851.3 - 852.5; tuff at 853.7 and fractured to 854.0; analcitized tuff 854.15 - 854.3; fractured at 855.0 with oil staining; fractured at bottom.

856.1 - 861.0

Mudstone with some oil shale - light brownish gray to light gray with rare medium brownish gray; HCl - no; earthy to chalky luster; laminated with common streaked and distorted bedding; fractured at top, 856.6, 856.8 and 858.0; from 858.0 to 861.0, opposing fractures in "poker chips" about 10-20 fractures per foot; zone of highly altered, very soft tuff at bottom, with heavy solution.

861.0 - 866.8

Oil shale - light, medium and dark brownish gray; HCl - no; earthy with some satiny luster; laminated with common streaked and distorted bedding; nahcolite(?) cavity at top with heavy solution to

861.9; solution cavity at 862.4; nahcolite(?) cavity from 864.0 - 864.7; tuff bleb at 865.3. 863.75 - 864.0 missing.

866.8 - 871.4

Oil shale (lean) - light to medium brownish gray; HCl - minor; earthy luster; laminated with some streaked and distorted bedding; tuff layers 868.0, 868.5 and 870.0; rich zone 871.0 - 871.1; common tuff streaks and stringers throughout.

871.4 - 875.65

Oil shale - light, medium and dark brownish gray with some medium greenish brown; HCl - no; earthy luster; laminated with rare streaked bedding; fractured 873.2 and 873.6; some tuff streaks and stringers throughout.

875.65- 883.95

Mudstone with rare oil shale - buff and light gray to light and medium brownish gray; HCl - no; earthy luster; laminated with common streaked bedding and common distorted bedding; fractured 876.4, 877.1 and 878.2; interbedded tuff at 878.15; fracture traces at 879.75; fractured at 881.0 - 881.8; kerogen-rich zone 883.0 to bottom; fractured at bottom; some tuff stringers throughout. 879.0 - 879.55 Compressive Strength Sample.

883.95- 895.2

Mudstone and siltstone - buff and light gray to light brownish gray; HCl - no; earthy to chalky luster; laminated with some distorted bedding; fractured from top to 885.1; cross-bedding at 885.5; fractured 885.6 - 886.2 and 887.5 - 888.2; zone of soft rock with fractures 889.8 - 890.0; fractured and jumbled 890.4 - 891.2; fractured at 891.5; solution zone at 892.0 and solution zone in interbedded tuffs at 892.45; 892.45 to bottom highly broken and jumbled with some fracturing. 893.75 - 894.7 missing.

895.2 - 899.6

Oil shale - medium to dark brownish gray with rare medium greenish brown; HCl - no; earthy with some satiny to vitreous luster; laminated with common streaked and some distorted bedding; interbedded tuffs with heavy solution and shaly parting in rich zone to 896.6; analcitized tuff at 897.45; solution cavity at 898.2, mildly distorting bedding; zone of tuff

and common gilsonite at 899.3; some tuff streaks and stringers throughout interval.

899.6 - 910.85

Oil shale - light, medium and dark brownish gray; HCl - no; earthy luster; laminated to color banded with rare streaked, some distorted, bedding; entire interval contains tight, calcite coated, microfractures; partially retorted zone at 902.3; interbedded tuffs 902.75 - 903.4; fractured 903.75 - 905.2; probable horizontal fractures 906.2 - 906.7; fractured 906.7 - 908.0, 908.8 - 909.7 and at 910.2; common tuff streaks and stringers throughout interval.

910.85- 921.55

Oil shale - light, medium and dark brownish gray; HCl - no; earthy luster; laminated with common streaked and distorted bedding; fractured at 912.0; top to 912.8 has common interbedded, buff-colored tuff streaks, mildly distorting bedding; 913.0 - 914.0 has soft tuff and oil shale with heavy solution and breakage; some solution vugs 914.0 - 915.1; fractured 917.6; irregular tuff 918.55; fractured 920.5; some tuff streaks and stringers throughout. BOTTOM R-6 (?).

921.55- 933.65

Marlstone - buff and light gray to light brownish gray, with some medium brownish gray; HCl - yes; chalky to earthy luster; laminated with common streaked bedding; fractured throughout interval with common blebs and streaks of pyrite; solution and pitting 922.8 - 923.55 and 924.6 - 925.1; analcitized tuff at 927.7 with interbedded tuffs 929.0 - 930.5; tuffs 930.9 and 931.4; solution and pitting 931.4 to bottom. 933.0 - 933.65 missing.

933.65- 948.5

Mudstone - light to medium brownish gray with medium greenish brown and light gray; HCl - no; earthy luster; laminated with common streaked and rare distorted bedding; nahcolite (?) cavity from 937.0 - 938.0; fractured 938.0 - 939.2; fractured 940.4 and 941.4; analcitized tuff at 941.7; fractured with shaly parting 943.15 - 944.4; solution cavity 944.2; solution vug with pyrite at 944.5; analcitized tuff at 945.6; fractured 946.8 - 947.5 with tight fracture traces to 947.8; interbedded

tuffs 948.1 to bottom; small fracture  
948.7. 935.0 - 937.0 missing.

948.5 - 953.3

Mudstone and siltstone - light to medium gray with rare light brownish gray; HCl - yes; chalky luster; massive with some laminations; solution pits and vugs throughout interval; fractured throughout interval; some tuff streaks and stringers with pyrite throughout.

953.3 - 963.65

Marlstone - light gray to light and medium brownish gray; HCl - yes; earthy luster; laminated to banded with common streaked bedding; mild retorting at 954.0; tuff layer at 955.0; tuff layer at 956.8 has flowed upwards along fracture to 955.6; analcitized tuff at 957.9; solution cavity and tuff layer at 960.1 (analcite?); tuff at 960.6, with tuff blebs to 961.0; minor solution of tuff at 963.15; fractured at bottom; common tuff stringers throughout interval. 957.2 - 957.7 Compressive Strength Sample.

963.65- 974.6

Sandstone - light to medium gray with some medium brownish gray; HCl - yes; chalky luster; massive with irregular and distorted medium brownish gray silty laminae throughout; fractured at top to 964.1 and at 965.0; from 967.0 to 970.4 heavy zigzag fracturing; some tuff stringers throughout interval. Correlation with bottom of 6-D and 1-D (?)

974.6 - 987.35

Marlstone - light and medium gray to light and medium brownish gray; HCl - minor; chalky to earthy luster; laminated with common streaked, rare distorted bedding; common tuff stringers throughout interval; gilsonite streak at 975.8; tuff layer at 975.9, mildly distorting lower bedding; interbedded tuff at 976.4, distorting bedding above; tuff cavity (analcite?) at 977.0; fracture trace from 977.0 - 977.4; tuff layers 977.4 and 982.8.

987.35- 993.6

Sandstone - medium to light gray with common medium brownish gray; HCl - yes; chalky luster; massive with common, irregular, medium brownish gray, silty, laminae, no laminae below 989.9; fractured at 992.0.

993.6 -1001.0

Mudstone - light and medium gray to light and medium brownish gray; HCl - no; earthy luster; laminated to banded with some streaked bedding; common blue-gray tuff stringers throughout; kerogen-rich zone 993.9 - 995.1; analcitized tuff at 944.85; tuff layer at 945.6.

TOTAL DEPTH